

MONITORING OF THE 1982 CHLORDIMEFORM APPLICATION
IN THE IMPERIAL VALLEY



ENVIRONMENTAL HAZARDS
ASSESSMENT PROGRAM

State of California
Division of Pest Management, Environmental Protection & Worker Safety
Unit of Environmental Monitoring & Pest Management
1220 N Street, Sacramento, California 95814

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MONITORING OF THE 1982 CHLORDIMEFORM APPLICATION
IN THE IMPERIAL VALLEY

by

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Environmental Hazards Assessment Program
California Department of Food and Agriculture

ABSTRACT

Results from the chlordimeform trial applications produced measurable air concentrations in the part per billion range both at the field border and at a 100 ft location upwind from the field. No chlordimeform was detected in water samples from canals immediately adjacent or downwind of the test field. This data suggested that water contamination of surface canals would not be a problem during the application season scheduled in 1982. Air contamination of residential areas remained an unresolved question to be answered by field monitoring.

The monitoring results from commercial chlordimeform applications in the Imperial Valley from 7/21/82 to 8/25/82 confirmed the trial results characterizing undetectable (minimum detectable, 1ppb) water concentrations throughout the monitoring period. Additionally, air sampling in both agricultural and urban residential areas proved to be negative (minimum detectable, 1ppb). Chlordimeform was not found to be a general air or water contaminant during its use in the Imperial Valley Cotton Pest Abatement District.

ACKNOWLEDGMENT

We wish to thank the Imperial County Agricultural Commissioner's Office, the City of Calipatria and the Imperial Irrigation Company for cooperation in establishing sampling sites.

DISCLAIMER

The mention of commercial products, their source or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such product.

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I. INTRODUCTION

Chlordimeform has been proposed as a means of controlling the Tobacco budworm and bollworm (Heliothis spp.) on cotton within the Imperial Valley Pest Abatement District. The California Department of Food and Agriculture requested in June, 1982 that the Environmental Hazards Assessment Program (EHAP) design a monitoring study to assess the impact of the proposed chlordimeform application period on the air and water of the Imperial Valley. The requested study protocol was prepared and reviewed (Appendix I) prior to the Department's final action to grant registration of chlordimeform for a special local need. In addition, trial field applications were conducted using the proposed formulations and application methods to determine chlordimeform air and water concentrations at the field site. The chlordimeform spray period monitoring was initiated July 21, 1982 to coincide with the first aerial chlordimeform applications and extended through August 25, 1982.

II. SITE DESCRIPTION

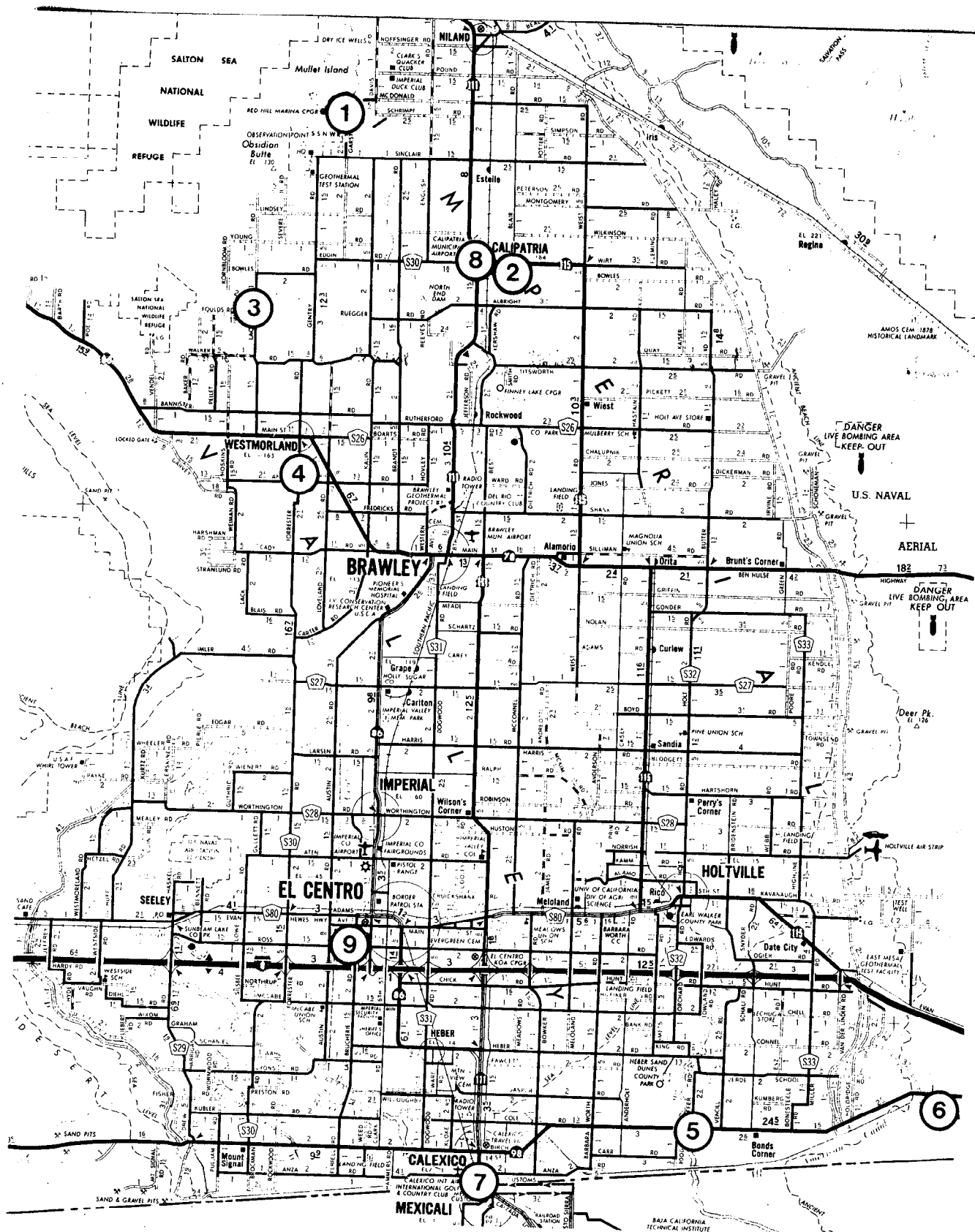
The registration of chlordimeform was restricted to the Cotton Pest Abatement District of Imperial County. The monitoring study area was limited to the boundaries of this district as defined by the U.S.-Mexico border on the south and the Salton Sea to the north. Eastern and western borders of the study were designated by the extent of the Imperial Irrigation District.

More than 90% of the estimated 40,000 acres of cotton grown within the Cotton Pest Abatement District is located in a crescent shaped band bordering the south-east edge of the Salton Sea and extending southward to the vicinity of Brawley. The agricultural air monitoring site in Calipatria (pop. 2703) was centered well within this potential application area, while an urban air monitoring site in El Centro (pop. 25,000) was outside of the principle cotton growing region. Air and water monitoring locations are shown in Figure 1.

All irrigation and domestic water is supplied to the Imperial Valley from the Colorado River by the Imperial Irrigation District. An open canal system is used to transport the water to the point where individual or municipal water users draw their supply.

The period allowed for application was established as July 8, 1982 through September 15, 1982. The weather for this time period in the Imperial Valley is characterized by high temperatures (both day and night), moderate to high humidity and little precipitation.

Figure 1. Chlordimeform Monitoring Site Locations in Imperial Valley, 1982



III. FORMULATION AND APPLICATION

Two formulations of chlordimeform were registered under four trade names:

<u>Formulation</u>	<u>Percent Active Ingredient</u>
Galecron 4E	48.5%
Galecron SP	97.0%
Fundal 4E	48.5%
Fundal SP	97.0%

All applications were restricted to fixed-wing aircraft operated under the conditions specified in the Department's registration document.

A total of 36,870 lbs. of chlordimeform was applied at a rate of 0.25 lbs/acre (active ingredient) during the 1982 application season.

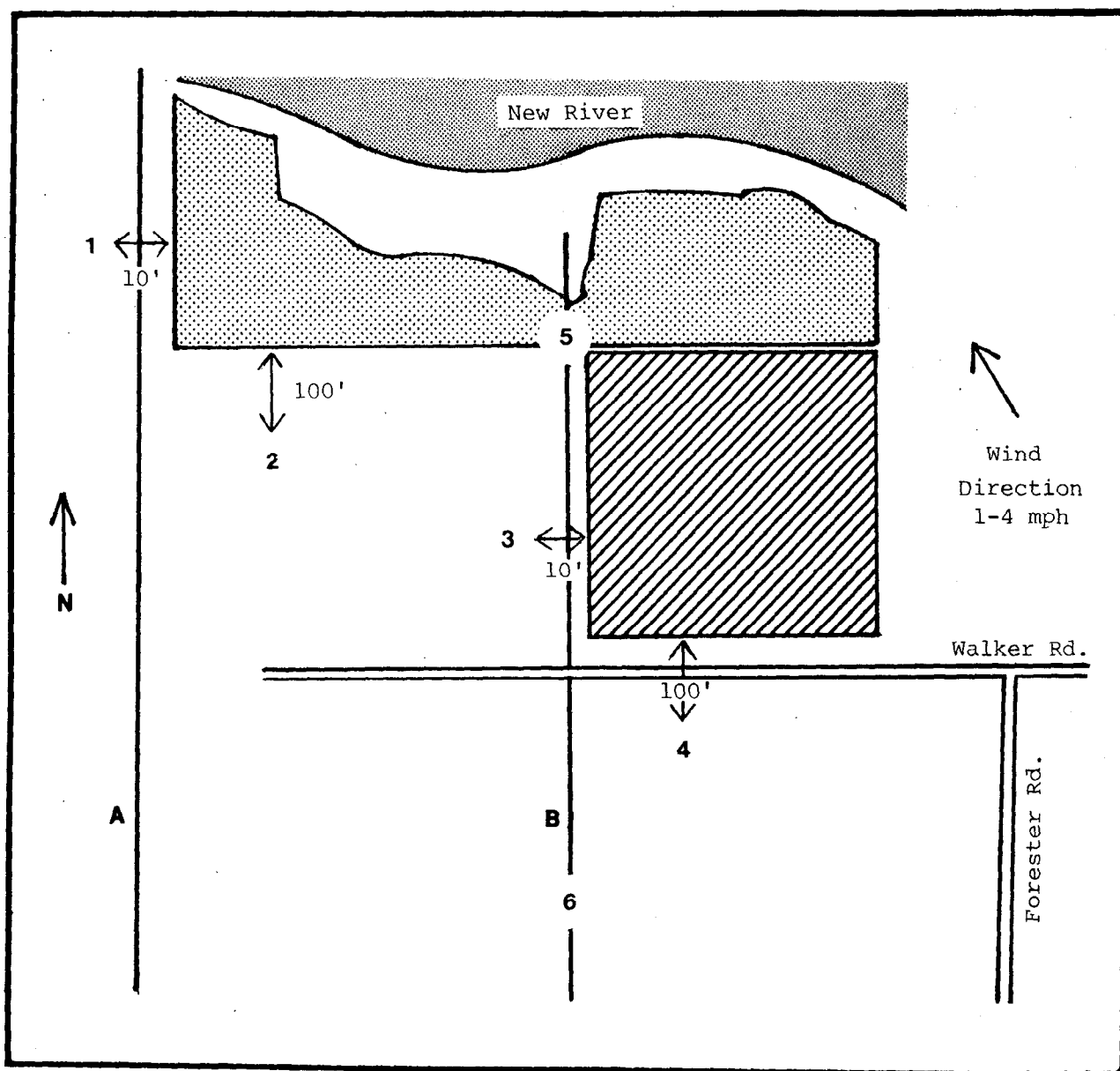
IV. MATERIALS AND METHODS

A. Field Trials



Prior to the application period an experimental field trial was conducted to determine off-site drift concentrations. The trial was conducted on June 16, 1982 on two fields of cotton north of Westmorland. Fundal SP (97% active ingredient) was applied at 0.25 lbs./acre to the first field of 186 acres and Galecron 4E (48.5% active ingredient) was applied at 0.25 lbs/acre to the second field of 150 acres.

Four high volume air samplers calibrated to draw 0.85 cubic meters of air per minute (30 cubic feet) were positioned at each field site. Two samplers were placed 10 feet from the crop's west border and two 100 feet from the south border as shown in Figure 2. Sampled air was drawn through 4 inch diameter glass cartridges packed with 125 ml of pre-cleaned XAD-2 resin. Sampling times ranged from 75-85 minutes. Background air samples were collected at one site prior to the application. All air samples were immediately packed on dry ice following collection.

Figure 2. Chlordimeform Field Trial Site Locations



KEY:

 = Fundal (SP)	
 = Galecron (EC)	1-4 = High-volume Air Sampling Sites
A = Trifolium 7	5,6 = Water Sampling Sites
B = Trifolium 6	

Replicate water samples were taken upstream and downstream from the application site on canal Trifolium 6. Background and post application samples were collected using 1 liter amber bottles with foil-lined caps. The samples were packed with ice and transported to the CDFA chemistry laboratory in Sacramento.

B. Air Monitoring

Air sampling sites were located on the roofs of local government buildings with written permission from the managers (Appendix III).

Ambient air was sampled at monitoring sites 8 and 9 (Figure 1) for one 24-hour period during each week of the monitoring study. This 24-hour period was subdivided into four, 6-hour sequential samples. Low volume air samplers consisting of a carbon vane pump (Gast model 2531) with fixed orifice flow controller and electronic timer provided vacuum to draw ambient air at a rate of 15 liters per minute through each of two 6" x 5/8" I.D. glass tubes packed with pre-cleaned XAD-2 macroreticular resin. Both tubes were connected to the pump with vinyl tubing and a copper "T" fitting to produce a resultant flow rate of 30 liters per minute. All air samples were placed on dry ice during transport to the state chemistry laboratory. The resin from both tubes was combined in the laboratory for analysis.

C. Water Monitoring

Water sampling sites were selected to differentiate between chlordimeform concentrations originating outside of the Pest Abatement District (Arizona and Mexico) and those resulting from applications within it. Two replicate samples were collected each week at seven designated locations: 3 canal and 4 river sites. Sampling locations outside of the treatment area were the All American Canal (Figure 1, location 6) before it entered agricultural land and the New and Alamo rivers near their crossings of the Mexican border into the U.S. (Figure 1, locations 7 & 5). Sampling locations within the treatment area were the New and Alamo rivers (Figure 1, locations 3 & 1) prior to their entering the Salton Sea and at the following canal locations:

1. Calipatria, C-West (Figure 1, location 2)
2. Westmorland, Trifolium lat 5 (Figure 1, location 4)

Both of these canals feed domestic reservoirs. All samples were collected in either one-liter amber glass bottles or one-quart mason jars. The samples were sealed with aluminum foil-lined caps, stored and transported on wet ice until

analysis at the CDFA laboratory.

D. Quality Control

In addition to the protocol study, water samples were collected during one monitoring week to determine the amount of degradation taking place due to sample transport and/or biological activity. Two replicate samples spiked with chlordimeform accompanied routine water samples at each location.

Ten milliliters of a chlordimeform standard solution (450 ppb) were pipetted into each of fourteen one-liter amber bottles with foil-lined caps. The bottles were then frozen for preservation along with a portion of the stock solution which was to be analyzed later for its exact concentration. On August 10, the spiked bottles packed with dry ice, were transported to the study area. On the following day, when routine water samples were collected, the spiked bottles were also filled with sampled water and packed on wet ice along with the usual samples. Spiked and unspiked samples were subjected to identical storage and transportation conditions as well as identical analytical techniques.

E. Chemical Analysis

All chemical analyses were performed by the Chemistry Laboratory Services Unit of the CDFA at the Unit's main laboratory in Sacramento. Collection efficiency of the XAD-2 macroreticular resin was determined by James N. Seiber, Environmental Toxicology Department at the University of California at Davis and confirmed by the CDFA laboratory in Sacramento. Because the efficiency was determined to be greater than 80%, field sample values were not adjusted.

F. Sample Security

Each sample collected by EHAP was accompanied by a chain of custody form documenting the sequence of transfers from sample medium generation through chemical analysis (Appendix II). Every individual who handled the sample was required to sign and date the form, acknowledging receipt and relinquishment of the sample. This form was also designed for recording data and remarks to be keypunched into a computer file.

V. RESULTS

A. Field Trial Monitoring

Results from the field trial are given in Table 1. The negative results for water samples are significant because the field immediately adjacent to the canal received many upwind "edging passes" within 125' of the water.

Table 1. Chlordimeform Field Trial Results Referenced to Locations in Figure 2

Site	Type of Sample	Results*
1	Air, Spray Duplicate	22.07 ug/m ³ 25.75 ug/m ³
2	Air, Background Air, Spray Duplicate	00.00 ug/m ³ 03.68 ug/m ³ 04.41 ug/m ³
3	Air, Spray Duplicate	07.38 ug/m ³ 09.56 ug/m ³
4	Air, Spray Duplicate	07.74 ug/m ³ 04.90 ug/m ³
5	Water, Background Duplicate Water, Spray Duplicate	None Detected None Detected None Detected None Detected
6	Water, Spray Duplicate	None Detected None Detected

* To convert ug/m³ to ppb multiply by 0.125

The downwind samplers for the Fundal application collected the highest mean air concentration values of 22.07 and 25.75 ug/m³ for the 75 to 85 minute monitoring period.

B. Application Season Monitoring

The consistently negative results for both air and water samples are presented in Tables 2 and 3. These results demonstrate that chlordimeform was not a general contaminant of either the air or water of the Imperial Valley. The rapid dispersion of chlordimeform was probably due to its high volatility, the separation of cotton acreage by other crops and the variability in spray schedules. Any chlordimeform which reached the canals and rivers was most likely diluted to undetectable levels by the large volume of water.

Table 2. Chlordimeform Water Monitoring in Imperial Valley, 1982; Concentrations in Parts per Billion

		LOCATION ^a						
Date	Spray Week	1	2	3	4	5	6	7
6/24	B ^b	0.0 ^c	0.0	0.0	0.0	0.0	0.0	0.0
7/21	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/28	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/4	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/11	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/18	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/25	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

a. Referenced to locations in Figure 1

b. B = background

c. Minimum detectable level 1ppb

Table 3. Chlordimeform Air Monitoring in Imperial Valley, 1982; Concentrations in ug/m³

		LOCATION 8				LOCATION 9			
		<u>Sampling Period</u>				<u>Sampling Period</u>			
Date	Spray Week	0600 1200	1100 1800	1800 2400	2400 0600	0600 1200	1200 1800	1800 2400	2400 0600
6/24-25	B ^a	0.0	0.0	0.0	0.0 ^b	0.0	0.0	0.0	0.0
7/21-22	1	0.0	0.0	0.0	0.0 ^b	0.0	0.0	0.0	0.0
7/28-29	2 ^c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/4-5	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/11-12	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/18-19	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8/25-26	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

a. B = background, minimum detectable level 1.0 ug for background & week 1

b. Sampled 2400 - 0700

c. Minimum detectable level 0.5 ug for week 2 - 6

C. Quality Control

Resultant concentrations of the chlordimeform-spiked water samples are shown in Table 4. An analysis of variance (Table 5) performed on the spiked water samples indicated no pesticide degradation during transportation to the laboratory. Recoveries were 100% of spiked material.

Table 4. Chlordimeform-spiked water sample results

LOCATION ^a	1	2	3	4	5	6	7
RESULTS (ppb)	4.7	3.5	5.2	5.3	5.0	4.0	ND ^b
	5.2	5.4	5.2	4.5	2.5	4.0	4.8

a. locations referenced to figure 1

b. no data

Table 5. Analysis of Variance of Chlordimeform-Spiked Water Samples

Source of Variation	df	SS	MS	F
Treatment	6	3,6169	0.6028	0.70 ns.
Error	6	5.1800	0.8633	
	12	8.7969		

ns. = non significant at 5% level of significance

APPENDIX I

STUDY PROTOCOL

MONITORING DESCRIPTION FOR THE PROPOSED
CHLORDIMEFORM PROGRAM IN IMPERIAL COUNTY
5/4/82

I. OBJECTIVES

To monitor environmental levels of selected pesticides applied during a proposed chlordimeform spray period.

II. PERSONNEL

The monitoring program will be under the overall supervision of Ronald J. Oshima, Environmental Hazards Assessment Program (EHAP) (Phone 916-322-2395 or ATSS 492-2395). Key personnel participating from EHAP-CDFA are listed below:

Lee Neher - Responsible for the study design, supervision over sample collection and data processing results. Phone (714) 787-4684 or ATSS 651-4684.

Tom Mischke - Responsible for selection of sampling methodology, field storage and transport of collected samples, and liaison to CDFA Chemistry Laboratory Services for questions concerning all aspects of chemical analysis of collected samples. Phone (916) 322-2395 or ATSS 492-2395.

III. STUDY TIMETABLE

The exact time period for the outline study has not been determined. It is projected that the desired treatment period would encompass the month of August 1982 and for a duration of approximately six weeks.

IV. MONITORING PLAN

Due to the currently indefinite nature of the requested chlordimeform application, the term "treatment area" will encompass whatever geographical boundaries are created. To provide a more useful hazards assessment, the analyses of samples collected will utilize a pesticide screen to evaluate the concurrent pesticide dosage of several compounds. Final selection of compounds to be analyzed for, other than chlordimeform, will be based on recent use report data and their respective chemical properties.

V. SAMPLING METHODS AND MONITORING TIMETABLE

Sampling for the selected pesticide will be separated into three tasks: First, to quantify the presence or absence of detectable air concentrations within the treatment area and within an adjacent urban area; second, to quantify the concentrations present in exposed surface water entering, within, and exiting the treatment area; third, to quantify the concentrations present in rivers and/or streams before, within and downstream of the treatment area. Initial sampling design would call for each task to be assessed prior to the specific chlordimeform treatment period and then weekly, through, and including the week following the termination of the treatment period.

Section I - Air Monitoring

Air monitoring equipment will sample ambient air during a 12 hr daylight period (0600 - 1800) and immediate following 12 hr evening and early morning period (1800 - 0600 the next day). One sampling location will be located toward the center of the treatment area and the second situated in an urban area close to, but outside the treatment area. Low volume air samplers utilizing an adsorbant resin bed, orifice controller and electronic timer, will operate at a flow rate of 15 liters per minute (15 l/min.)

Section II - Impact on Existing Water Bodies

- a. 2 replicate water samples will be drawn from exposed surface water supplies at pre-determined sites above, within and downstream of the treatment area.
- b. 2 replicate water samples will be drawn from a maximum of 2 rivers and a stream which flow through the treatment area. Again, samples will be taken from pre-determined sites upstream, within and downstream of the treatment area.

Both the above water sample series will be collected in one liter glass bottles with aluminum foil cap liners.

VI. HANDLING AND STORAGE OF SAMPLES

All sampling media and containers will be prepared and pre-numbered at the California Department of Food and Agriculture Laboratories in Sacramento. Each device or

container will be shipped to the sampling sites with an accompanying Chain of Custody Record. The Chain of Custody Record will be filled out by all parties handling or storing the sampling media or sample containers from the time they leave the Sacramento CDFA lab until they are returned to the lab for analysis. The Chain of Custody Record also contains an internal chain of custody record for use by the laboratory.

All samples will be collected by EHAP personnel, sealed in glass containers and stored in the following manner until and during transport to the CDFA laboratory in Sacramento.

On Dry Ice (-70°C)

air samples

On Ice (4°C)

tank samples

water samples

VII. ANALYSIS OF SAMPLES

All samples will be analyzed for the presence of the selected pesticides by CDFA Chemistry Laboratory Services. Quality control duplicate samples will be analyzed by CDFA and an alternate, EPA approved laboratory. If deemed necessary, selected samples may also be analyzed for other known breakdown products of the selected pesticides. Approximately ten percent of the total number of each type of sample collected will have duplicate analysis performed as part of the quality control program. Brief details of the analytical methods for each type of sample are available, if requested.

APPENDIX II

CHAIN OF CUSTODY

CHAIN OF CUSTODY RECORD
Use ball point pen only

ENVIRONMENTAL MONITORING
ENVIRON. HAZARDS ASSESSMENT
1220 N STREET, ROOM A-149
SACRAMENTO, CA 95814

Study #				Sample #					Sample type					Date On					Date Off					Person Collecting		Location	BSP Key	Spray Week	Remarks										
									Hi Vol	Lo Vol	Water	Fallout	Other	Mo	Day	Yr	Time on	Mo	Day	Yr	Time off																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
		1	8													8	2										8	2											

[illegible]

Partner: _____ Rep #: _____ Location: _____	Lab Results: _____ Save Extracts _____ Chlordimeform _____ Chemist: _____ Date: _____		
Remarks, observations, other chemicals, etc. KEY: Col. 32: B=Background S=Spray P=Post Spray Units M=PPM R=PPB T=PPT H=µg	Relinquished by: (Signature)		Date/Time
	Received by: (Signature)		Relinquished by: (Signature)
	Received by (Signature)		Relinquished by (Signature)
	Received by: (Signature)		Relinquished by: (Signature)
	Received for Laboratory by: (Signature)		Date/Time
Lab #			

APPENDIX III

PERMISSION FORM

STATE OF CALIFORNIA
DEPARTMENT OF FOOD
AND AGRICULTURE

ENVIRONMENTAL MONITORING & PEST MGMT
ENVIRONMENTAL HAZARDS ASSESSMENT
1220 N STREET, ROOM A-328
SACRAMENTO, CALIFORNIA 95814

During the summer months of July through September 1982, the Department of Food and Agriculture's Environmental Monitoring and Pest Management Unit will be sampling for the presence of Chlordimeform in specific areas of Imperial Co. We request your permission to collect air and/or water samples. Results of the analysis will be given to you on completion of the study.

Owner (Manager) Name _____

Signature of Owner (manager)

Granting Permission _____ Date _____

Property Address _____

Contact Person _____ Phone () _____

If any problems should arise, please contact:

Ron Oshima
916-322-2395

Lee Neher
714-787-4684

Study	Phone	Name, Address
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Distribution: Original to Headquarters, One copy to field files, one copy to owner